

## High Efficiency SiC/SiC Composite Heat Exchanger Structures, Phase I

Completed Technology Project (2010 - 2010)



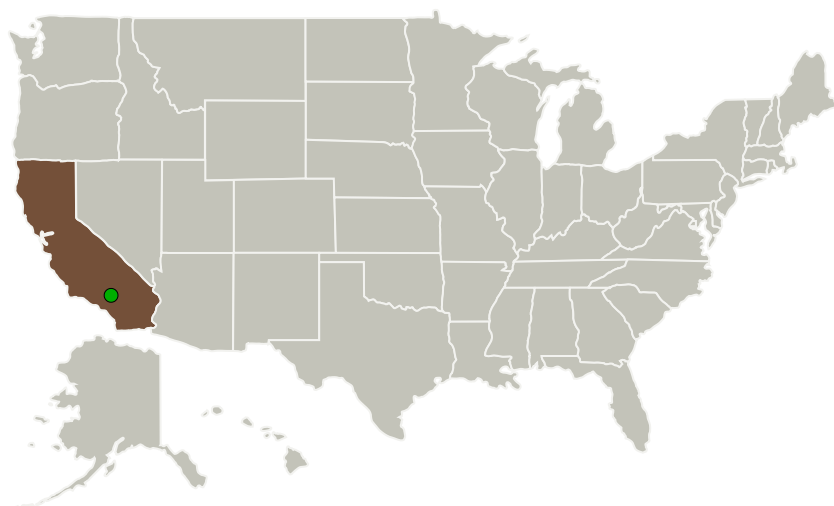
## Project Introduction

Scramjet propulsion systems for future hypersonic aerospace vehicles will be subjected to heating rates far greater than current materials can manage. In order to sustain high thermal loading while preheating the fuel, regeneratively cooled hot flow path components fabricated from ceramic matrix composites are being considered. The limited availability of high-temperature/environmentally durable materials focuses attention to silicon carbide fiber-reinforced silicon carbide (SiC/SiC) composites. These materials exhibit a unique combination of low density, high thermal conductivity and outstanding strength to near 3000

o

F. In order to exploit the benefits of SiC/SiC composites, methods are needed for fabricating high density/high conductivity components incorporating impermeable metal tube liners. Additionally, practical methods are needed for uniformly distributing coolant to the array of tubes via manifolding on the backside of the hot flow path surface. The objective of this Phase I program is to demonstrate a promising method for producing a high thermal efficiency SiC/SiC composite heat exchanger with low residual porosity and high interlaminar strength without having to resort to exotic and costly 3D fiber preforms. A functional actively cooled composite panel test article incorporating refractory metal tubes will be designed, fabricated and delivered to NASA for burner rig and/or thermal evaluation.

## Primary U.S. Work Locations and Key Partners

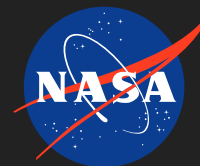


High Efficiency SiC/SiC  
Composite Heat Exchanger  
Structures, Phase I

## Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

## High Efficiency SiC/SiC Composite Heat Exchanger Structures, Phase I



Completed Technology Project (2010 - 2010)

Organizations Performing Work	Role	Type	Location
Rolls-Royce High Temperature Composites Inc	Lead Organization	Industry	Huntington Beach, California
● Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

## Primary U.S. Work Locations

California

## Project Transitions

**January 2010:** Project Start**July 2010:** Closed out**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/139047>)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Rolls-Royce High Temperature Composites Inc

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Principal Investigator:**

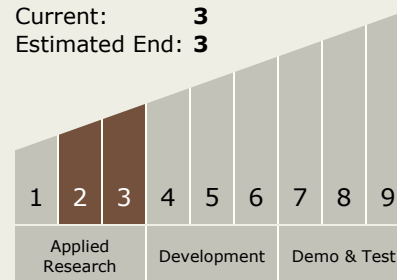
Wayne S Steffier

## Technology Maturity (TRL)

Start: 2

Current: 3

Estimated End: 3



# High Efficiency SiC/SiC Composite Heat Exchanger Structures, Phase I

Completed Technology Project (2010 - 2010)



## Technology Areas

### Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - └ TX12.1 Materials
    - └ TX12.1.6 Materials for Electrical Power Generation, Energy Storage, Power Distribution and Electrical Machines

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System